College of Wales, Sea Front, Aberystwyth," is not similarly distinguished. No development of the past three years has so greatly interested the universities of the United Kingdom as the institution of the Ph.D., yet there is, so far as we can find, no reference to this new degree. The budgets of some of the American universities are likely to make a Briton envious—Wisconsin, for example, has a revenue of 3,532,306 dollars; but it may well be for his peace of mind that Columbia, Harvard, Leland Stanford Junior, and others have modestly declined to disclose their wealth. The statement "No particulars received" follows the names of a large number of American and some British universities overseas.

(2) The aim of the "Yearbook of the Universities of the Empire" is different from that of the other two books. Each of the fifty-nine universities of the Empire finds it necessary to publish a calendar; the stouter, the more dignified. In the Yearbook all essential information regarding the origin of the university, its history and equipment, admission, faculties, degrees, scholarships, fees, hostels, etc., from each of these calendars, is reduced to a few pages. The names and offices of all members of the staff are recorded, and "since a statement of the sources of the various degrees held by university teachers gives, in small space, information regarding the educational history of their holders, much trouble has been taken in ascertaining their source." Under the heading "The Years 1916–19" events of interest in the life of the university, such as benefactions received, new posts created, alterations of curricula, etc., are recorded.

Comparing the present edition with the one which preceded it (1916–17), we note that the universities are no longer placed alphabetically throughout, but arranged in groups—England and Wales, Scotland, Ireland, Canada, Australasia, South Africa, India—with an admirable introduction preceding each group. A feature of the book which will make it of great and permanent interest is the Appendix on the Universities and the War. It is a summary of the services, other than combatant (these had been, in part, dealt with in the 1915 edition), rendered by the universities. "So numerous and varied have these been that it is impossible, in looking back, to picture the war as progressing towards a successful issue without them." This record, brief as it is, persuades the reader of the justice of the editor's remark. The compression within a book of this size of so much and such varied information reflects great credit not only upon the editor's diligence, but also upon his skill.

Encyclopædic Chemistry.

Phosphore, Arsenic, Antimoine. By Dr. A. Boutaric and A. Raynaud. (Encyclopédie Scientifique: Bibliothèque de Chimie.) Pp. iii+417. (Paris: Octave Doin, 1920.) Price 9.50 francs.

THIS book is one of the forty volumes on chemistry forming part of an encyclopædia of science which is expected to run to about a thousand volumes. The treatment aims at a compromise between text-books and dictionaries—the books being intended at the same time for reading and for reference. This is obviously a very ambitious scheme, and it raises the question as to whether such a compromise between matter and style is one which is likely to be useful. In the opinion of the reviewer, books intended for reference should aim at giving the fullest possible information in the smallest possible space. If the elementary rules of grammar are satisfied, the busy worker will be content, and questions of style have little interest for him. The references to original literature should in each case be checked carefully with the originals, and no differentiation should be made between the nationalities of the various discoverers. Although the well-known treatises compiled by German authors are not perfect, they are all we possess which have any pretension to completeness, and have proved of inestimable service to thousands of chemists of all nationalities. A proposal to publish such works in English has not proceeded beyond the stage of discussion, great as are the possibilities of success if trustworthy compendia could be issued within a reasonable period.

The book under review is written in a clear and readable style, and the descriptions and references are such as might be expected in a moderately advanced text-book. They are not nearly so complete as might reasonably be required in an encyclopædic work. The index is also far from satisfactory. The bulk of the references are to publications in the French language, and in more than one instance grave injustice is done in the text to workers of other nationalities. This is much to be regretted; science has no nationality, and in a search for information such questions have not the slightest interest for the reader. If this inclination is to be followed in further volumes to be issued, the reviewer has no hesitation in saying that the usefulness of the work will be profoundly prejudiced. It may, for instance, be more gratifying to the author to attribute the formulation of the equation for a unimolecular reaction to Berthelot, but as the prior publications of Har-

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court and Esson and of Wilhelmi are readily accessible, and well known, at least to English chemists, the impression on the reader is far from satisfactory. Other instances of like nature could be quoted.

J. R. P.

Our Bookshelf.

The British Charophyta. By James Groves and Canon George Russell Bullock-Webster. Vol. i. Nitelleæ. With Introduction. Pp. xiv + 141 + xx plates. (London: The Ray Society, 1920.) Price 25*s*.

This monograph of the British Charophyta is a valuable addition to the literature of British botany. It has also a personal interest for many British botanists as representing the work on this group, embracing much of the leisure of forty years, of the brothers Henry and James Groves, to the former of whom the volume is fittingly dedicated. In 1880 Messrs. H. and J. Groves published in the *Journal of Botany* a "Review of the British Characeæ," in which an attempt was made to give an account of all the then-known British species, with illustrations and some particulars as to their variation and distribution. This was the first of a series of papers by the same authors, in which have been included descriptions and figures of fresh species added from time to time to the British list, records of distribution, and other notes. The present monograph, in which Canon Bullock-Webster co-operates, is the carefully considered outcome of these years of work. The systematic portion, which includes the first of the two subdivisions (Nitelleæ and Chareæ) of the group, is preceded by an introductory section dealing with the growth and structure of the Charophyta generally, and their distribution and affinities; this is well illustrated by numerous text-figures from various sources, and several plates. Each of the species is beautifully represented in a lithographed plate, mainly from drawings by Miss Mary Groves. The authors recognise six genera of Charophyta, five of which, Nitella and Tolypella, comprising the Nitelleæ, and Nitellopsis, Lamprothamnium, and Chara, included in the Chareæ, are represented in Britain. The key to all the British species, which precedes the general systematic account, includes thirty-two species, in several of which distinct varieties are recognised. Under each species there is a complete account of the synonymy with reference to previous publications, a full description in English, and an account of the distribution; notes on variation, affinities, and nomenclature are also added.

Monografia de l'Ordre dels Rafidiòpters (Ins.). By R. P. Llongí Navas, S.J. (Publicacions de l'Institut de Ciències.) Pp. 93. (Barcelona: Institut d'Estudis Catalans, 1918.)

Father Navas is well known as a student of the taxonomy of that miscellaneous assemblage of insects formerly included in the old Linnean order of the Neuroptera. In the monograph before us he deals with the curious and remarkable "snake-flies." Their position in any scheme of classification has long been a difficulty, and opinions thereon are very diverse. Father Navas prefers to follow Handlirsch and to regard them as constituting an order of their own—the Raphidioptera. Others merge them along with the "alder-flies" (Sialidæ) to form the order Megaloptera, while a third alternative is that followed by some entomologists of combining the Megaloptera with the Plannipennia into a single order, Neuroptera. We are inclined to follow the intermediate course, as there is little doubt that the Raphidiidæ have their nearest allies in the Sialidæ, although they are more highly specialised than the latter.

The present monograph is exclusively systematic—only eight lines are devoted to the larval stages, for example—and the sole observations on structure deal entirely with those characters of the external anatomy which are utilised by the systematist. Two families are recognised, comprising thirteen genera and seventy-one species. The greater number of genera occur in Europe and North America; only one genus is African, and four are Asiatic, but none are peculiar to either of those continents. In Britain we have four species comprised within three genera, but the group has been hitherto so little collected that in the next decade we shall probably totally revise our views on its geographical distribution. The author has done a service in bringing together the various species within a single memoir, and his keys and descriptions will enable the different forms to be identified. Of the forty odd figures, many are sketchy and rather deficient in detail.

A. D. I.

Some Famous Problems of the Theory of Numbers and in particular Waring's Problem: An Inaugural Lecture delivered before the University of Oxford. By Prof. G. H. Hardy. Pp. 34. (Oxford: At the Clarendon Press, 1920.) Price 1*s*. 6*d*. net.

The theory of the integral numbers is a subject in which it is frequently easy to conjecture new results and extremely difficult to prove them. An example of a result which must have been based on conjecture is known as Waring's theorem, that every positive integer is the sum of nine (or fewer) positive cubes, of nineteen (or fewer) biquadrates, and so on. A proof of this result, asserted in 1782, was first approached by Prof. Hilbert, of Göttingen, who showed in 1909 that every integer n is the sum of a finite number not exceeding $g(k)$, independent of n, of exact kth powers. It has been established, by transcendental analysis developed long since the days of Waring, that $g(3)=9$ as asserted by him, but whether $g(4)=19$ is still uncertain, though this number has been shown not to exceed 37. The only positive integers known to be inexpressible as a sum of eight cubes (at most) are 23 and 239.

Prof. Hardy and Mr. Littlewood have recently developed a new method of applying properties of

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